THE POSSIBILITIES OF USING UNMANNED AERIAL VEHICLES – DRONES IN CRIME SCENE INVESTIGATION[1]

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INTRODUCTION

In order to ensure the quality of an investigation and crime scene processing as its segment, it is first necessary for authorized officials to establish the perimeter of the crime scene properly, and then to secure and protect it until the arrival of the crime scene investigation team. Only an unchanged appearance of the crime scene allows for a high quality and thorough collection of relevant information, objects and traces, in order to elucidate a criminal offence or event. The perimeter of the crime scene should encompass all traces that are found (Bjelovuk, 2022: 107). At the very beginning of crime scene investigation, it is recommendable to make a few photographs of the crime scene as it was found. The gathering of data at the crime scene is usually done in practice as part of the criminalistic-tactical tasks, while the crime-investigation experts and forensics specialists deal with the

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forensic investigation of the crime scene, which involves inspecting the scene, finding and then marking and preserving relevant objects and traces. In order to be able to make a decision about which objects and traces are relevant to the solving of a crime case, the specialist must understand the mechanisms of using the objects and the origins of traces, and be able to create a mental reconstruction of the event. Because of this, it is necessary for them to possess some specific professional knowledge and the skills for carrying out investigation and the forensic analysis of the physical evidence they found on site. They should also be familiar with the further procedure of the analysis of found objects and traces in the forensic lab, in order to observe/respect/ensure the chain of custody and its continuity, given that they take part in its formation. There are multiple methods which allow the specialists to document the crime scene properly, or to prove what happened at it: the verbal method, the photographic method, the video method, the measuring and graphic method, and the method of lifting (Žarković, et al., 2012: 117). Securing the scene of an event, whether it is a crime scene or the scene of a traffic accident etc., involves permanently preserving the important features of the scene for further analysis (Lipovac, et al., 2019: 280). The end result of a completed crime scene investigation is the investigation documentation, whose main components include the documents created after the found state of the scene of the event was preserved. Elements of the documentation are the investigation report, the report of the forensic inspection of the scene, photo documentation, sketches and the situational plan. Court practice has shown that the most important element of the investigation documentation is the investigation report (there were cases in practice where documentation was accepted as adequate despite not having any other elements aside from the investigation report, while in cases where there was no investigation report the documentation was deemed to be inadequate). Because of this, the documentation is organized in such a way as to attach all other elements of the investigation documentation to the investigation report.

Because the purpose of an investigation is to establish material facts about a certain event which is the subject of the investigation, the contents of a quality investigation documentation must fully match the factual state at the scene of the event. There are three basic principles that must be observed while making the investigation documentation and these are the principles of objectivity, comprehensiveness, and compliance (Lipovac et al., 2018: 39). Respecting these principles while producing investigation documentation ensures that the documentation contains only such facts as an authorized official has established by observation or on the basis of personal expert knowledge. The investigation documentation should contain everything that the authority in charge of the proceedings and all other users thereof may find important. All of its elements should be mutually synchronized, in terms of their contents, terminology, but also their substance. Regardless of who

is in charge of an investigation, its success rate is closely related to the applied professional knowledge and the used equipment (Žarković et al., 2012: 98).

Using the verbal method for describing the factual state at the scene implies the use of words. In order to be more efficient, it is suggested to use a dictation recorder, and then later to enter the facts into a textual document (the investigation documentation, the forensic report on the crime scene investigation and other written documents). The use of measuring and graphic method for documenting the state of the crime scene requires specific knowledge and equipment, as well as measuring instruments (measuring tapes, laser rangefinder, angle measuring devices, etc.) and the creation of a sketch and a situational plan of the scene (drawing kit, a computer with drawing software such as AutoCAD or ScenePD, etc.).

When it comes to photographing and video recording as the methods of documenting the situation and details of the crime scene, it is a fact that analogue devices have been phased out, and that digital cameras and camcorders whose technical characteristics allow for the level of quality required for investigation photography are used instead. Although rarely, certain countries use photogrammetry devices and equipment (Lipovac et al., 2010). Analytic photogrammetry involves the use of cameras and computers in order to establish all the measurements needed for the analysis, the creation of a situational plan or even a 3D model of the crime scene, or some specific objects. In the criminalistic-technical field, that is forensic analysis of the crime scene, spheric photography is also used, and it includes panoramic photographing using a camera from a few determined points of view, and then a software matching of the photos, so that the software such as *Easypano* or a similar one should allow for a virtual "walk around" the scene (Bjelovuk, 2022: 120). Another modern device that finds its use in the forensic analysis of the crime scene is the thermal vision camera (Kesić & Bjelovuk, 2021). Unmanned aerial vehicles could also find their place in the forensic investigation of crime scenes.

UNMANNED AERIAL VEHICLES

Drones are unmanned aerial vehicles, or aircraft, which are controlled using a unit located on land, or on an object on land, on a ship, on a different aircraft, or other vehicle by a navigator. They are remotely controlled. They receive controls from a station that is on land, in the water, in the air, at a nearby or a distant location. Unmanned vehicles also include the ones that autonomously travel along a predetermined trajectory, using an auto pilot. These flying devices are constructed in a way that allows them to function without a human crew or a pilot, and they can be reused many times, with the exception of cruise missiles, which are loaded

with an explosive charge and intended for destroying their targets. Unmanned aircraft can also be combined, meaning that they are partially controlled by a unit on land, and partially fly on their own, using previously memorized navigational data. Over the last couple of years, the definition of an unmanned aircraft has changed, so that "the U.S. Department of Defense (DoD), followed by the FAA and the European Aviation Safety Agency (EASA), adopted the term UAS or Unmanned Aircraft System" (Valavanis & Vachtevanos, 2015: 44).

They found the most widespread use for military purposes,[3] where they first started being used for scouting, target marking, combat and other goals, but were later adapted for civil use. Thus, unmanned aircraft find their place in agriculture, traffic, photography and other fields. They are manufactured from different materials that possess certain characteristics; they should be light, but durable at the same time. The materials that are most often used include plastic and composite materials. The technical specifications of the aircraft (dimensions, weight, load capacity, power, cruise speed, maximum speed on optimal altitude, tactical radius, range, flight ceiling, lift-off speed, etc.) differ from model to model. They might even possess multiple engines depending on their construction. While constructing an aircraft like this, just as when creating a manned aircraft, it is very important to pay attention to its aerodynamics. The basic elements of an unmanned aircraft construction are the body/housing, the control unit, the signal receiver, the battery, and a mobile device. The kind of sensor used on an unmanned aircraft depends on the type and purpose of the aircraft. Controlling an aircraft requires a specially trained user. On the controlling unit, there is a screen which allows for real time tracking of the aircraft's position in the air, and also the footage from the onboard camera.

The use of unmanned aerial vehicles for photographing crime scenes presents a real revolution in capturing the situation at the crime scene. In order for this technology to transition into being routinely used by the forensic crews that investigate crime scenes, a comparative analysis should be made of conventional methods of crime scene investigation and the use of unmanned aircraft or drones, as they are also referred to. Photos made from above, from the so-called birds' eye view, allow for a better overview of the objects, items and traces found at the crime scene, especially in the case when there are both wide and narrow angle shots of the crime scene. This can even be applied in the cases involving an aircraft falling from a great height, especially in the case of a prior explosion on the aircraft in the air, when the spread area of objects and traces (wreckage pieces, bodies and possessions of the casualties) can encompass up to a few square kilometres of geographically varied, and poorly connected and accessible terrain (Žarković et al.,

3 Predator MQ-1 drones were used as espionage tools during the wars in the Balkans. The operators of the unmanned aerial vehicles flew them from hangars in Albania. See more on this in: М. Мазети, *Хируршки прецизно* [M. Mazeti *Surgical Precision*], Лагуна, 2014, стр. 108.

2009:195) In addition, the use of unmanned aircraft is much more practical, when compared to the frequently necessary recording from a helicopter (for instance, for getting a wider picture of the event scene) because of the size and mass of the vehicle, as well as the cost of operating it. The weight/mass of unmanned aircraft in civil use does not exceed 150 kg. It is easier to manoeuvre/steer an unmanned aircraft than a massive machine such as a helicopter. These vehicles also require a smaller surface to take off and land. Depending on the manufacturer and the model of the aircraft, the range varies from 200 m to 2000 m from the control unit.

When an unmanned aerial vehicle is used to photograph something, the quality of the photograph is very important. It depends on a lot of factors, such as the following, for example: the relative position of the camera and the object being captured; whether the camera is moving or standing still in relation to the object, and vice versa. With that in mind, it is very important to properly set up the parameters for recording, the shutter aperture and exposure length which regulate the amount of light that is allowed through the objective. When the object and the camera are in a state of relative movement, that is, when they are moving in relation to one another, it is important for the exposure to be as short as possible, in order to avoid capturing a series of consecutive positions, thus rendering the recording unclear. Also, the quality of the recording is affected by the resolution, which is directly related to the price of the aircraft. Because of this, the camera that the aircraft uses to capture footage must be stable (any motion and movement of the vehicle must be stabilized) for the recording to be clear. Logically, the camera should have the highest resolution possible, as the resolution will directly influence the quality of the recording.

External conditions under which the recording is made may also affect the quality of the footage. Drones can be used both indoors and outdoors. The wind is known to have a significant effect on the recording quality. The effect of the wind can partially be predicted by using a software solution, but unexpected wind surges must always be taken into consideration. The cameras which are built into these aerial vehicles are of various DSLR[4] technologies.

Considering that these vehicles are operated by a software and remote control, they can be vulnerable, so a lot of attention must be given to their cyber security (Yağdereli, et al., 2015). Another issue that comes into focus is battery life. Bearing this in mind, it is vital for the operator in the field to be supplied with spare batteries with a long-life span and a precise indicator of their charge level.

Drones can be equipped with high resolution photo and video cameras, thermal imaging cameras, heat sensors, radars and other devices which allow them to scan the terrain according to different parameters, so they can be used with the aim

4 Digital Single-Lens Reflex camera

of finding human remains (Dukowitz, 2020), and can also be equipped with face recognition software. So, it should not come as a surprise that the use of drones, as well as processing the data collected by them, requires specialized training. It is worth noting, that there are experts specializing in the analysis and interpretation of drone-collected data (https://digitpol.com/drone-forensics/).

LEGAL FRAMEWORK FOR USE OF UNMANNED AIRCRAFT

The advent of unmanned aircraft, the ever-increasing potentials for their use and their availability to a large number of users, has naturally given rise to the question of legal regulations for this kind of aircraft. Because of this, a lot of countries have codified some of the most important questions regarding the use and the necessary conditions for safe usage of unmanned aircraft. Especially important in this area is the legal regulation of police usage of unmanned aircraft, considering that they are being used more and more frequently in daily police activities, including for detecting and solving criminal cases. Certain authors point out that the possibilities of the usage of drones, or as they sometimes call them "planes with brains", are almost unlimited (Dwyer-Moss, 2017/2018: 1049). The necessity of the existence of precise and clear rules about the usage of this kind of aircraft stems from the needs of air space safety and national security, as well as from the fact that with their usage may involve violation of the basic rights and freedoms of the citizens, primarily the right to privacy.

The first state in the world to solve legally the question of the use of unmanned aircraft was Australia by creating the Civil Aviation Safety Regulations in 1998. Some subsequent changes regulated the safe usage of drones, which were then described as Remotely Piloted Aircraft (RPA). These amendments contained a general prohibition against operation of an RPA in a way that created a hazard to another aircraft or personal property, which was supported by more specific provisions concerning the operation of Remotely Piloted Aircraft Systems (RPAs) (Butler, 2014: 437-439). These regulations were subsequently amended in 2016 to clarify requirements and limitations governing safe operation of RPAs. This new scheme categorizes RPA by size and weight. The concept of 'standard RPA operating conditions', which is defined in regulation, implies that the RPA is operated within the visual line of sight of the person operating it and the RPA is operated at or below 400 ft above ground level, by day. Also, it is stipulated in what circumstances the RPA is not operated: in a prohibited area; in a restricted area; within 3 nautical miles of the movement area of a controlled aerodrome; over an area where a fire, police or other public safety or emergency operation is being conducted without the approval of the person in charge of the operation, etc.

(Butler, 2019: 1043-1044). In the beginning, the registration of these vehicles was not required, but it was later requested for any aircraft heavier than 250 g. Also, unmanned aerial vehicle operators should be educated about the basic rules of air traffic safety. Despite all this, Australian legislation still contains no provisions on the usage of cameras, and recording from drones (Butler, 2019: 1044).

In the United States, the usage of drones is regulated on both the federal and state levels. The federal legislation makes a distinction between the usage of drones for recreational and commercial purposes. Special rules apply for the aircraft used by certain agencies, including the police. The Code of Federal Regulation (Title 14, 2016) introduced mandatory registration of all drones, the terms for their safe usage and the conditions that must be met by the people operating them. The Federal Aviation Administration (FAA) is responsible for introducing, supervising, and implementing the federal rules that apply to the usage of drones. A part 107 license "allows operations of drones or unmanned aircraft system (UAS) under 55 pounds at or below 400 feet above ground level for visual line-of-sight operations only". Also, this rule has a number of other restrictions, including not being allowed to fly a drone at night. Some flight restrictions associated with a part 107 license can be overcome by applying for waivers (Drones – A Report on the Use of Drones by Public Safety Agencies and a Wake-Up Call about the Threat of Malicious Drone Attacks, 2020: 7). In order to become part 107 certified, each drone pilot for the agency needs to pass the FAA's Aeronautical Knowledge Test to obtain a Remote Pilot Certificate (Drones – A Report on the Use of Drones by Public Safety Agencies and a Wake-Up Call about the Threat of Malicious Drone Attacks, 2020: 7). As regards the use of drones by the police, the part 91 COA (Certificate of Authorization) applies. Operating under the part 91 COA allows the police agency to set standards for determining whether someone is ready to be a pilot, because they do not need to take the FAA's Aeronautical Knowledge Test (Drones – A Report on the Use of Drones by Public Safety Agencies and a Wake-Up Call about the Threat of Malicious Drone Attacks, 2020: 7). A COA provides authorization for activities that are prohibited by part 107, such as flying at night, flying beyond the visual line of sight, flying over people, flying at altitudes above 400 feet above ground level, and flying in controlled airspace (Drones – A Report on the Use of Drones by Public Safety Agencies and a Wake-Up Call about the Threat of Malicious Drone Attacks, 2020: 7-8). Under a part 107 license, the drone is considered a civil aircraft for commercial operations, whereas under a COA, the drone is considered a public aircraft that is only used for governmental purposes (Drones – A Report on the Use of Drones by Public Safety Agencies and a Wake-Up Call about the Threat of Malicious Drone Attacks, 2020: 7-8).

When talking about the usage of drones by the police, it is interesting to note the Freedom from Unwarranted Surveillance Act was enacted in 2015 in Florida.

This law prescribes that law enforcement agency may not use a drone to gather evidence or other information, except:

1. to counter a high risk of a terrorist attack by a specific individual or organization if the United States Secretary of Homeland Security determines that credible intelligence indicates that there is such a risk;

2. if the law enforcement agency first obtains a search warrant signed by a judge authorizing the use of a drone;

3. if the law enforcement agency possesses reasonable suspicion that, under particular circumstances, swift action is needed to prevent imminent danger to life or serious damage to property, to forestall the imminent escape of a suspect or the destruction of evidence, or to achieve purposes including, but not limited to, facilitating the search for a missing person;

4. to provide a law enforcement agency with an aerial perspective of a crowd of 50 people or more, provided that: the law enforcement agency must have policies and procedures that include guidelines: for the agency's use of a drone; or the proper storage, retention, and release of any images or video captured by the drone; that address the personal safety and constitutional protections of the people being observed.

A drone may be used to assist a law enforcement agency with traffic management and to facilitate a law enforcement agency's collection of evidence at a crime scene or traffic crash scene. Otherwise, evidence obtained or collected in violation of this act is not admissible as evidence in a criminal prosecution in any court of law in Florida.

In the Republic of Serbia, the question of unmanned flying vehicles is only partially legally solved. Namely, the Air Traffic Act defines an unmanned aircraft as an aircraft whose crew is not located on board, and that is either controlled remotely or uses autonomous flight (Article 3, paragraph 1, item 4). According to these regulations, unmanned aircraft can be used for commercial, scientific, educational, sporting and other purposes as long as they do not interfere with air traffic safety (Article 10, paragraph 1). The Directorate for Civil Aviation was tasked with determining more precise conditions for the safe usage of unmanned flying vehicles, their categorization, equipment, registration and maintenance, along with the requirements that the parties that operate unmanned aircraft must meet. The law also provides for responsibility of persons using an unmanned aircraft for any potential damage caused through its use (Article 10, paragraphs 2 and 3). Along with the responsibility for the caused damage, a legal entity could be liable for breaking the law if they used an unmanned aircraft in such a way as to endanger air traffic safety or that is contrary to conditions prescribed by the law. Natural persons can also be held responsible for these offences. The same law also mentions that the act of flying a foreign unmanned aircraft in the airspace of the Republic of Serbia

without permission of the Directorate for Civil Aviation is considered a violation of the state's airspace (Article 23, paragraph 2). In order to get approval to fly from the Directorate for Civil Aviation, one must first obtain the consent from the ministry in charge of defence (Article 23, paragraph 3). In the case of any breach of this legal obligation, legal and natural subjects shall answer for their infraction (Article 258, paragraph 1, item 15 and Article 260, paragraph 1, item 13).

Some more detailed regulations concerning unmanned aircraft can be found in the Regulation on Unmanned Aircraft (hereinafter: the Regulation), which was adopted by the Civil Aviation Directorate in 2020. The Regulation determines the conditions for the safe use of unmanned aircraft, their classification, categorization, maintenance and the conditions which the parties that operate them must meet. However, the provisions of the Regulation only apply to: unmanned aircraft, whose maximal take off mass (MTOM) is less than 0.25 kg, whose maximum speed does not exceed 19 m/s and which cannot achieve more than 80 J of kinetic energy; unmanned aircraft whose maximal take off mass (MTOM) is greater than 150 kg; unmanned aircraft that are used for operational needs of the authorities responsible for defence, internal affairs and customs, and for flying unmanned aircraft in enclosed spaces. The Regulation requires the registration of unmanned aircraft in the Aircraft Registry, and allows for the maximum flight altitude of 100 meters above the ground, unless the Directorate has previously approved the flight to go ahead at a greater altitude and allocated the required air space. It is important to note, that the Regulation generally stipulates that an operator of an unmanned aircraft (whether a national or a foreign citizen) must be a of age, a person in good health who has passed an aptitude test that proves that they have the knowledge necessary for safely operating an unmanned aircraft (Article 20).

As in the presented comparative laws of other countries, the legislation of the Republic of Serbia also defines unmanned aircraft, their types, and the conditions for their safe usage. We especially point out the importance of regulating the competencies of unmanned aircraft operators, because expertise and competence, just as in all other professions, guarantee proper and lawful action (Bjelovuk et al., 2021: 233). However, unlike the legislation in the United States, Serbian law does not specifically regulate the use of unmanned aircraft by the police. This omission can also be noticed in the cases where the police use some other technical means such as, for example, thermal vision cameras, because using them endangers the right to privacy and makes room for their illegal use (Kesić & Bjelovuk, 2019: 999). With this in mind, it is important for the lawmakers to resolve these issues as soon as possible.

DISCUSSION

Because investigations take place in order to establish facts about some event, which may have taken place at various, sometimes inaccessible locations, the use of these devices can prove very useful. It could reduce the risk of injury of the investigation team members, it would allow for much faster access and insight into the situation at the event scene, and then a much more adequate choice of necessary measures, manpower and equipment, in line with the circumstances of the case at hand. Also, the use of unmanned aircraft could be very useful for situations where an investigation must be conducted following an explosion. Namely, in these locations, where forensic investigation is very peculiar, there is a risk of new explosions. Here, the use of these flying vehicles can be very important, because recording the scene can help notice and neutralize the danger of new explosions.

Conventional methods for crime scene investigation start with gathering information about the event (what crime or event took place, who perpetrated them, what are the consequences, the time when it occurred etc.) that took place, and about the location (micro and macro location), and then inspecting the crime scene using senses and equipment (different kinds of lighting devices and detectors). In order for the original state at the crime scene to remain unchanged, it is necessary for a forensic investigator to enter the very scene and start making photographs according to the methodology of crime scene photography. Generally, he/she must wear protective equipment and have predetermined guidelines that are to be followed while at the crime scene, in line with the international standard operational procedures from the ISO 17020 standard. The main flaw of this approach to the crime scene is the factor of human error because inattention and unprofessional behaviour might contaminate or alter the crime scene. Also, even with the necessary caution and controlled movement of the investigation team members, the risk of contamination is practically impossible to avoid when it comes to latent or hardly visible footsteps of the perpetrator (Žarković, et al., 2010: 735). This risk could be avoided by using an unmanned aircraft, considering the fact that it does not have any physical contact with the crime scene. (Sharma, et al., 2019) Using an onboard camera, it is possible to gain an insight into the situation at the scene, and to record during the static phase of the investigation. Recording from an unmanned aircraft is much less time consuming when compared to the conventional method of doing it at the crime scene. However, this gives rise to new issues regarding the quality of the footage received from an unmanned aircraft, and the possibility of a cyber security breach in respect of the collected data. Also, it would require special training of the operational forensic experts that are charged with investigating the scene. Another issue is recording during the so-called dynamic phase of the investigation, where it is necessary to make certain movements at the crime scene. It goes without saying that the use of unmanned aircraft by forensic teams, and also the use of the

footage collected from them further in the legal process for specific legal issues, must be properly regulated by the law.

When a trace is found at a crime scene, it calls for scale photography, which allows proper reading of the trace dimensions from a photograph. When using an unmanned aircraft, this activity becomes more complicated.

Forensic crime scene investigation also requires the use of the measuring-graphic method (sketching of the scene) with the goal of determining the coordinates of the positions of various objects and traces at the crime scene, which requires further footage analysis using special software in order to map the recorded terrain. The traces are found by the forensic investigators. Certain traces require being taken from the crime scene for further analysis in forensic laboratories. This involves physically removing the trace and sampling the crime scene, packing and marking the packaging, in order to ensure the chain of custody. When using an unmanned aircraft, this activity becomes more complicated.

The use of unmanned aircraft requires additional education of the crime scene investigation team members, both for controlling the aircraft, and for the processing of the collected data. Also, using the necessary software requires licensing, which increases the cost of use of this equipment.

CONCLUSION

Modern technology makes a lot of jobs considerably easier to do, including the ones in the field of forensic investigation of crime scenes. But, the application of this technology involves new risks, and the possibility of misuse. It could be useful to combine the conventional means of forensic crime scene investigation with recording from unmanned aircraft in the situations where it is necessary for the safety of the investigation team members (for example, an investigation of the crime scene under a risk of explosion).

The currently existing operational procedures that are applied in the forensic practice during crime scene investigation do not recognize the use of unmanned aircraft. Their use in everyday and routine forensic crime scene investigation should be delayed. Even though the use of unmanned aircraft makes human activities in certain areas easier, it also carries the risk of misuse, starting with using the aircraft as a weapon to destroy various targets, illegal collection of personal data, or other unethical behaviours. This claim is supported by the fact that the legal regulations of the Republic of Serbia for the use of unmanned aircraft for forensic crime scene investigation are not complete.

REFERENCES

Bjelovuk, I. (2022). Kriminalistička tehnika. Beograd: Kriminalističko-policijski univerzitet.

Bjelovuk Ivana, Kesić Tanja, Žarković, M. Comparative Analysis of Competences in the Fields of Fire and Explosion, Revija za kriminalistiko in kriminologijo, (2021), vol.72(3), 233-244.

Butler, D. (2014). The Dawn of the Age of the Drones: An Australian Privacy Law Perspective. University of New South Wales Law Journal, Vol. 37(2), 434-470.

Butler, D. (2019). Drones and Invasions of Privacy: An International Comparison of Legal Responses. University of New South Wales Law Journal, Vol. 42(3), 1039-1074.

Code of Federal Regulations, www.law.cornell.edu, available 1st Sept.2022.

Drones – A Report on the Use of Drones by Public Safety Agencies and a Wake-Up Call about the Threat of Malicious Drone Attacks (2020), www.cops.usdoj.gov > RIC > cops-w0894-pub, accessed on 1st Aug.2022

Dukowitz, Z. Drones for CSI—How Drones Can Help Criminal Forensic Scientists Find Human Remains. 2020. Available at https://uavcoach.com/drones-criminal-forensics/#:~:text=Using%20drones%20equipped%20with%20infrared,parties%20should%20concentrate%20their%20efforts.

Dwyer-Moss, J. (2017/2018). The Sky Police: Drones and the Fourth Amendment, Albany Law Review, Vol. 81(3), 1047-1070.

Freedom from Unwarranted Surveillance Act, www.leg.state.fl.us/, available 1st Aug.2022

Žarković, M., Bjelovuk, I., Kesić, T. (2010). Kriminalistički i dokazni aspekti postupanja sa tragovima stopala, *Pravni život, časopis za pravnu teoriju i praksu*. God. 59, knjiga 539, (9), 729-742 (glavni i odgovorni urednik prof. dr Slobodan Perović).

Žarković M., Mlađan, D., Bjelovuk, I. (2009). Criminal investigation procedure on the scenes and within the conditions of massive accidents, *NBP Žurnal za kriminalistiku i pravo,* Beograd, Kriminalističko-policijska akademija, vol. 14 (2), 185-202.

Žarković, M., Bjelovuk, I., Kesić, T. (2012). Kriminalističko postupanje na mestu događaja i kredibilitet naučnih dokaza. Beograd: Kriminalističko-policijska akademija.

Lipovac, K., Vujanić, M., Obradović, D., Nešić, M. (2018). Uviđaj saobraćajnih nezgoda za javne tužioce i saobraćajnu policiju. Beograd: Pravosdna akademija. Beograd: Glosarijum.

Lipovac, K., Bjelovuk, I., Nešić, M. Primena savremenih uređaja i opreme u forenzičkoj obradi mesta događaja, *Pravo i forenzika u kriminalistici* (Zbornik radova sa istoimenog Prvog naučnog skupa sa međunarodnim učešćem, Kragujevac, 15–17. Septembar 2010.), Beograd: Kriminalističko-policijska akademija, 2010, str. 27-38, (urednik: prof. Dr Željko Nikač).

Lipovac, K., Jovanović, D., Nešić, M. (2019). *Osnove bezbednosti saobraćaja.* Beograd: Kriminalističko-policijski univerzitet.

Kesić, T., Bjelovuk, I. Application of thermal imaging cameras in crime detection, Teme – casopis za drustvene nauke – Journal for social sciences, Vol. 48(4), 2019, 997-1011.

Mazeti, M. (2014). *Hirurški precizno*. Beograd: Laguna.

Pravilnik o bespilotnim vazduhoplovima, "Službeni glasnik RS", br. 1/2020.

Sharma, Bhoopesh & Chandra, Geetanjali & Mishra, Ved P. (2019). Comparitive Analysis and Implication of UAV and AI in Forensic Investigations. 824-827. 10.1109/AICAI.2019.8701407.

Yağdereli, E., Gemci, C., Aktaş, A. Z. A study on cyber-security of autonomous and unmanned vehicles. The Journal of Defence Modeling and Simulation: Application, Methodology and Technology Special Issue: Modeling & Simulation for Cyber Security of Autonomous Vehicle Systems.Vol. 12, (4), 2015, 369-381.

Zakon o vazdušnom saobraćaju, "Službeni glasnik RS", br. 73/2010, 57/2011, 93/2012, 45/2015, 66/2015 – drugi zakon, 83/2018 i 9/2020.

Valavanis K.P., Vachtevanos, G.J. Editors (2015). Handbook of Unmanned Aerial Vehicles. Springer Reference Available at https://dh8.kr/workshop/sejong_control/Handbook_of_Unmanned_Aerial_Vehicles.pdf 7th July 2022.